

ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research

Vol. 14, Issue, 10, pp. xxx-xxx, November, 2023

**International Journal of
Recent Scientific
Research**

DOI: 10.24327/IJRSR

Research Article

CORRELATION OF PLACENTA THICKNESS IN THIRD TRIMESTER WITH ULTRASONOGRAPHIC GESTATIONAL AGE, ESTIMATED FETAL WEIGHT, BIRTH WEIGHT AND PERINATAL OUTCOME

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DOI: <http://dx.doi.org/10.24327/ijrsr.20231409.xxxx>

ARTICLE INFO

Article History:

Received xxx

Received in revised form xxxxxxxx

Accepted xxxxxxxx

Published online xxxxxxxx

Keywords:

Placental thickness, gestational age, estimated fetal weight, actual birth weight, perinatal

ABSTRACT

Introduction-Placenta may be referred to as the 'mirror of the perinatal period, which has not been sufficiently polished'. Abnormal thickness of placenta is well recognised as a diagnostic harbinger in a wider spectrum of pathological events. Placenta thickness is very much related to fetal development and may be a key in perinatal outcome. At term the placenta is approximately 3 cm thickness and weighs about 500 to 600 grams. Aims & Objectives-To describe association of placenta thickness with gestational age, estimated fetal weight, actual birth weight and perinatal outcome. Materials & Methods-This prospective observational study was conducted in the Department of Obstetrics and Gynaecology in Rama Medical College Hospital & Research Centre, Kanpur from August 2022 to September 2023. 90 pregnant women with randomly selected pregnancy in third trimester were taken. Ultrasound examination done. Placenta thickness was measured in mm trans-abdominally. Result There was positive correlation between placenta thickness and estimated fetal weight at Different gestational age with $p < 0.001$. There was also positive correlation between placenta thickness and actual birth weight with $p < 0.001$. Perinatal outcome was good in women with normal placental thickness. Conclusion Ultrasonographic measurement of placental thickness in antenatal period can be effective, simple and non-invasive Method of estimating fetal growth. The measurement of placental thickness should therefore be carried out routinely during Obstetric USGs.

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INTRODUCTION

Adequate fetal growth and subsequent normal birth weight depends on the efficient delivery of nutrients from the mother to the fetus. Placental thickness is the easiest placental dimension to measure, Placental thickness of 2.5 cm to 3.75 cm is taken as normal. A placental thickness of ≥ 4 cm is regarded as abnormal¹. It is documented that placental weight in a normal pregnancy at term is about one-fifth of the fetal weight. placental thickness is the simplest measurement of placental size. Measurement of placental thickness has to be taken perpendicularly at the level of umbilical cord². Thick placenta seen in Rh-ve pregnancy, GDM, Anemia, TORCH infections, Hydrops fetalis, Fetal macrosomia². Thin placenta is seen in Preeclampsia, IUGR, Chorioamnionitis, Placenta membranacea². Placental thickness tends to gradually increase with gestational age in a linear fashion. sonographically, this can be seen to approximate 1 mm per week and the thickness of placenta can be used to approximate gestational age. Anterior placentas are

~0.7 cm thinner than posterior or fundal placenta³. Placenta is visible by 10 weeks gestation at transabdominal ultrasound, color Doppler imaging used to detect intervillous blood flow by 12-14 weeks, Between 12-16 weeks, chorion and amnion fuse. By 15 weeks, placenta is well formed. Placenta may show a few focal sonographic lucencies with slow flow, called venous lakes⁴. The normal function of placenta reflects on normal fetal weight and subsequent normal birth weight⁵.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Obstetrics and Gynecology in Rama Medical College Hospital & Research Centre from August 2022 to September 2023 on 90 pregnant women with singleton, pregnancy in 3rd trimester who were sure of their dates and consented to participate in the study after taking approval from the ethics committee. Patients were sent for ultrasound examination after taking informed and written consent.

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Ultrasonography done at 28 to 40 weeks of gestation. Fetus was scanned for viability and congenital anatomical defects. Placental thickness was measured in mm trans-abdominally by placing ultrasound transducer perpendicular to the plane of placenta in the area of cord insertion near mid-placental portion at third trimester. The calculation of placental thickness was done from echogenic chorionic plate to placental myometrial interface. All placental measurements were taken during relaxed phase of uterus as contractions can spuriously increase placental thickness. Obstetric ultrasonography was carried on the patients using **Ge versana** ultrasound machine with 2-7 MHz curvilinear transducer. Gestational age was determined by measuring the biparital diameter, Abdominal circumference, head circumference, femur length. Estimated fetal weight was determined by measurement of biparital diameter, Abdominal circumference, and femoral length adopting the formula devised by Hadlock. Actual birth weight was measured immediately after birth using a pediatric weight scale. Apgar score, NICU admission and neonatal morbidity and mortality were observed.

The study subjects were selected based on following inclusion and exclusion criteria:

Inclusion criteria: All patients with singleton pregnancy. Patients with known LMP. Gestational age of ≥ 28 weeks up to 40 weeks.

Exclusion criteria: Unknown LMP, Multiple pregnancies.

RESULT

71.11% of cases were of age group between 25-35 years. Mean age of cases in this study was 27.4 years (**Table-1**).

Table 1 Distribution of cases according to age

Age in years	No. of cases
<25	22 (24.44%)
25-35	64 (71.11%)
>35	4 (4.44%)

Table 2 Distribution of cases according to parity

Parity	No. of cases
Primi	46 (51.11%)
G2	32 (35.55%)
G3	12 (13.33%)

51.11% of the cases in this study were primigravida (**Table-2**). Mean placental thickness in this study was 32.69 mm. In our study, placenta with thickness (determined by antenatal ultrasound) below 10th percentile ($< \text{mean} - 2\text{SD}$) were considered as abnormally thin placentae. Also placenta with thickness more than 95th percentile ($> \text{mean} + 2\text{SD}$) were considered as abnormally thick placentae. Placental thickness between 10th and 95th percentile was considered normal in third trimester. The pregnant women were divided according to placental thickness—those with thin, normal and thick placenta. Thin placenta: placental thickness less than 10th percentile. Normal placental thickness: placental thickness between 10th and 95th percentile. Thick placenta: placental thickness more than 95th percentile (**Table-3**).

Table-3 Mean, 10th and 95th percentile placental thicknesses

Mean placental thickness(mm)	32.69
10 th percentile placental thickness(mm)	28.4
95 th percentile placental thickness(mm)	40

Mean placenta thickness at 37 to 39 weeks is 36.29 mm, mean estimated fetal birth weight is 2636 gm and mean actual birth weight 2942.43 gm. Mean placenta thickness at < 37 weeks is 34.75 mm, mean estimated fetal birth weight is 2608.5 gm and mean actual birth weight is 3054.5 gm. Mean placenta thickness at > 39 weeks is 35.33, mean estimated fetal birth weight is 3539.33 gm and mean actual birth weight is 3208.67 gm. (**Table-4**). 24 cases had IUGR (26.67%) as per (**Table-5**). out of 90 babies delivered, 2 babies had APGAR score 0-3 at 1 min and only 1 baby had score 0-3 at 5 min. one neonate mortality observed. (**Table- 6**). Out of 90 babies delivered, 84.44% did not require NICU admission. Whereas 15.56% required NICU admission as per (**Table-7**).

Out of 90 babies delivered, 93.33% did not have respiratory distress. Whereas 6.67% had respiratory distress as per (**Table-8**).

Table 4 Distribution of mean placental thickness with estimated fetal birth weight and actual birth weight at term

Gestational age	Mean placental thickness(mm)	Mean EFBW(gm)	Mean Actual birth weight(gm)
<37 week	34.75	2608.5	3054.5
37-39 week	36.29	2636	2942.43
>39 week	35.33	3539.33	3208.67

Table 5 Distribution of cases according to birth weight

Birth weight	No. of cases
<2.5 kg	24 (26.67%)
2.5-3.5 kg	56 (62.22%)
>3.5 kg	10 (11.11%)

Table 6 Distribution according to APGAR score

APGAR score	@ 1 min	@ 5 min
0-3	2	1
4-6	12	10
7-10	76	79
Total	90	90

Table 7 NICU Admission

NICU Admission	Frequency	Percent
NO	76	84.44
YES	14	15.56

Table 8 Respiratory Distress

Respiratory Distress	Frequency	Percent
NO	84	93.33
YES	6	6.67

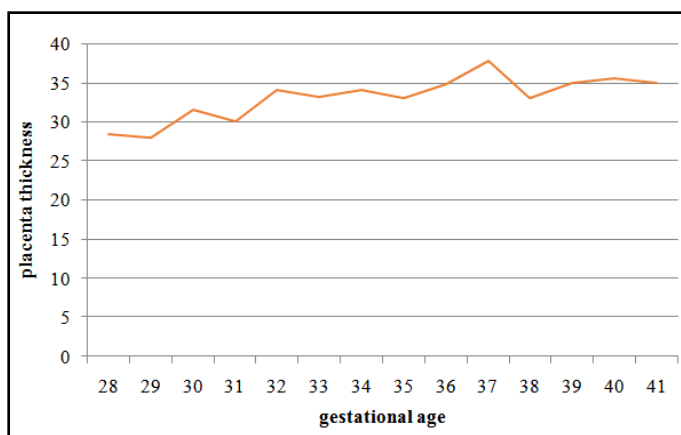


Figure 1 Placenta Thickness at different gestational age

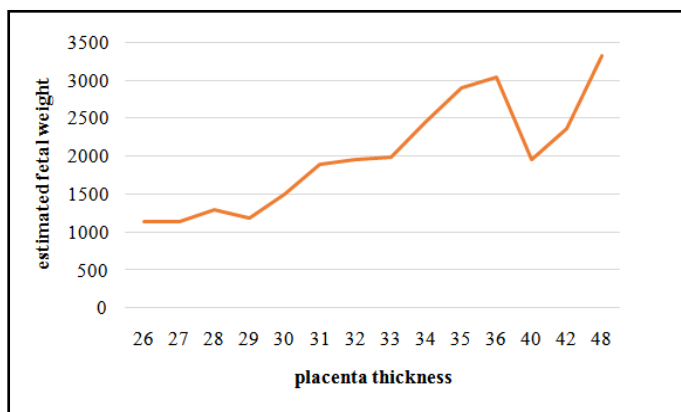


Figure 2 Graph of estimated fetal weight with placenta thickness

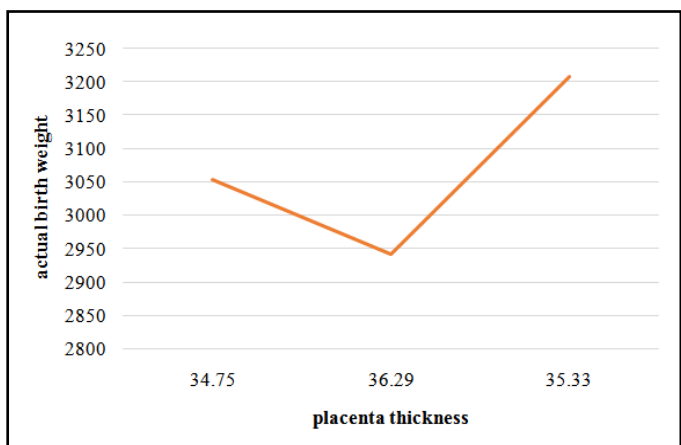


Figure 3 graph of actual birth weight with placenta thickness

There was positive correlation between placenta thickness and estimated fetal weight at Different gestational age with $p < 0.001$. There was also positive correlation between placenta thickness and actual birth weight with $p < 0.001$. Perinatal outcome was good in women with normal placental thickness.

DISCUSSION

Placenta is an essential organ for exchange of nutrients and metabolites between mother and fetus, provides gas exchange, excretory, endocrine and immune support for the developing fetus⁶. Placenta has an influence on fetal birth weight and abnormalities of placental growth may precede abnormalities in fetal growth. As the placenta is the first organ to manifest changes of disease in pregnancy, so its changes can be used to

predict many of fetal maternal complications⁶. P.O Abu, Ohagwu C C, Ezefz, et al. from Nigeria in 2009 conducted a study to investigate the relationship between PT and EFW. In his study max PT was 45.10 mm. In my study max PT was 48 mm⁷. M. P, Dombrowski, et al. in Detroit, USA in 1992 studied the association between thick placenta and perinatal outcome⁸. 71.11% of cases are of age group between 25-35 years. Mean age of cases in this study is 27.4 yrs. There is no significant correlation between age and placental characters. 51.11% of cases in this study are primigravida.

Kashika Nagpal, et al.² stated that placenta with thickness (determined by antenatal ultrasound) below 10th percentile ($< \text{mean} - 2\text{SD}$) were considered as abnormally thin placentae. Also placenta with thickness more than 95th percentile ($> \text{mean} + 2\text{SD}$) were considered as abnormally thick placentae. Placental thickness between 10th and 95th percentile was considered normal in third trimester. The pregnant women were divided according to placental thickness—those with thin, normal and thick placenta. Thin placenta: placental thickness less than 10th percentile. Normal placental thickness: placental thickness between 10th and 95th percentile. *Thick placenta: placental thickness more than 95th percentile. In this study, Mean placental thickness in our study is 32.69 mm. 10th percentile placental thickness is 28.4mm. 95th percentile placental thickness is 40mm. There was significant positive correlation between placental thickness and EFW in 2nd and 3rd trimester, in the study of P. O. Abu⁷. In our study when normal and abnormal PT are correlated with Birth weight, P value is < 0.001 . In our study we found that placental parameters have very important influence on perinatal outcome. This concludes that placental examination during ultrasonography is an essential tool to assess the perinatal outcome.

T. Karthikeyan, et al.⁹ stated that Placenta is closely related to the fetus and the mother, it acts like a mirror reflecting the status of both mother and the fetus. Kulman and Warsoff stated that a PT of < 2.5 cm at term, was associated with IUGR. La Torre, et al.¹⁰ opinioned that at no stage of the pregnancy placental thickness exceeded 4 cm indirectly, thus indicating the cut off value for the upper limit. In their study which was done on normal singleton pregnancies, the mean PT of the corresponding gestational weeks was 23.23 mm. Habib, et al.¹¹ in their study, said that the PT was 2.2 cm at 36 weeks in the fetus which weighed < 2500 gm. They concluded that PT was a predictor of LBW infants. Nasreen Noor, et al.¹ stated that Placental thickness appears to be a promising parameter for estimation of weight of the fetus because of increase in placental thickness with advancing gestational age. The Pearson's correlation coefficient between the two was 0.982, proving the significant positive correlation between PT and EFW. This as the PT increases, the EFW increases. Nasreen, et al.¹ there is linear correlation and strong positive correlation between PT and EFW, which is a very important component of antenatal care. Therefore it can be used as an additional sonographic tool in assessing fetal weight. Adhikari R, et al.¹² observed that EFW is dependent on PT which is similar to their observations.

Afrakhteh M, et al.¹³ observed a significant positive correlation between PT and EFW in 2nd and 3rd trimester which is coherent with their study. Placental thickness and estimated birth weight have a significant high positive correlation in both the trimesters as noted by Abu Po, et al.⁷. Khairy S. Ismail, et

al.¹⁴ in their study found that every 1 cm increase in PT increase fetal weight by 0.888 kg. The study found there is no correlation between b/w PT and maternal age. The study also found there is no correlation b/w PT and BMI.

Kashika Nagpal, et al.² stated that placental thickness is the simplest measurement of placental size and can be measured at any center equipped with ultrasound machine. Schwartz, et al.¹⁵ in 2010-2011 studied two dimensional sonography in Philadelphia between 18-24 weeks and found that mean PT and PD were significantly smaller in SGA infants. Ahn K H in 2017¹⁶ published that the higher placental thickness to estimated fetal weight ratio at 18-24 weeks gestation was associated with small for gestational age infants. Elsafi Ahmed, et al.¹⁷ studied ultrasonographic placental thickness in 53 Sudanese pregnant women in 2nd and 3rd trimester. They concluded that thickness of <25 mm during third trimester is less than normal and might be an indicator of IUGR and thickness of >45 mm was considered thicker than normal. Li, et al. in 2015¹⁸ demonstrated sonographic PT as one of the cost effective screening tool for detecting α -thalassemia major fetuses. Future studies could include interventions to see role of nutritional, life style factors and anticoagulants on placental thickness and fetal outcome.

Limitations

The sample size was small and there was only a single observer, there was a chance for an observer bias (inter observer variability), an instrumental bias etc.

CONCLUSION

In our study, we observed that placental parameter like placental thickness has influence on perinatal outcome. In countries like ours with poor resources, scan features of placenta along with baby and AFI may help improving perinatal outcome. Serial recordings of placental thickness during antenatal period help in better prediction of fetal prognosis. Future studies with large sample are required to identify high risk cases based on placental thickness. Fetal Doppler studies may be needed in cases with IUGR babies with thin placenta to decide when to terminate pregnancy. Subnormal placental thickness for a particular gestational age may be the earliest sign of intrauterine growth retardation. Measurement of placental thickness should therefore be carried out routinely during obstetric ultrasound. Sonographically identified abnormal placenta should alert the clinician to the possibility of compromised perinatal outcome and the need for evaluation of coexisting fetal anomalies and maternal disease. Examination of the placenta in pre and postnatal period gives us a clue about fetomaternal complications and is essential for protecting the attending physician in the event of medico-legal cases due to abnormal fetomaternal outcome.

Acknowledgements

The study was done at OPD of Rama Medical College Hospital and Research Centre. Department of Radiodiagnosis of Rama Medical College Hospital & Research Center

Declarations

Funding: No funding sources
Conflict of interest: none declared
Ethical approval: not required

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How to cite this article:

Kavita Verma., Shikha Paliwal and Rahul Ranjan, 2023. Correlation of Placenta Thickness in Third Trimester with ultrasonographic Gestational Age, Estimated Fetal Weight, Birth Weight and Perinatal Outcome. *Int J Recent Sci Res.* 14(10), pp. xxx-xxx
